Total laparoscopic repeat aortic surgery

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We report our initial experience with total laparoscopic repeat aortic surgery between June 2002 and October 2003. There were 4 patients, 3 men and 1 woman, ages 83, 67, 49, and 61 years, respectively. First operations were performed to treat aortoiliac occlusive disease. Repeat aortic surgery was indicated to treat para-anastomotic aneurysms (n = 2) and graft occlusion (n = 2). All patients underwent total laparoscopic surgery. There were no postoperative deaths. Only 1 patient had postoperative complications that required complementary surgical treatment. All patients were alive with patent revascularization after a mean follow-up of 14, 17, 20, and 12 months, respectively. (J Vasc Surg 2004;40: 822-5.)

Vascular surgery has entered the field of minimally invasive surgery. Some reports show that laparoscopic surgery to treat aortoiliac occlusive disease is feasible.[1-3] Recently we developed a new approach to total laparoscopic aortic bypass.[4] Taking advantage of our experience in laparoscopic surgery to treat aortoiliac occlusive disease (AIOD) reconstructions and infrarenal abdominal aortic aneurysm repair, we performed total laparoscopic procedures for repeat aortic surgery.

SURGICAL TECHNIQUE

The laparoscopic approach to repeat aortic surgery is through a transperitoneal left retrocolic or left retrorenal dissection. The patient is placed in a dorsal decubitus position, with an inflatable pillow (Pelvic-Tilt; O. R. Comfort) placed behind the left flank, which provides 50-degree to 60-degree rotation of the abdomen. Maximum right rotation of the operating table (ALM) affords an abdominal slope of 70 degrees to 80 degrees. The video monitor is viewed distally on the left side of the patient, and the surgeon is facing the patient's abdomen.

Pneumoperitoneum is insufflated up to 14 mm Hg with an open technique. A 45-degree or 30-degree endoscope (Storz-France) is positioned through this 10-mm trocar (Storz-France) on the anterior axillary line, 3 cm below the costal margin. Other ports are placed according to standard procedure.[4] Left retrocolic dissection is conducted in line with the Toldt fascia to the left renal vein. Left retrorenal dissection is conducted cranially and medially from the psoas muscle after incision of the retrorenal fascia. A complete right medial visceral rotation is performed. This averts effraction of the spleen during retraction of the kidney.

With the patient in a right lateral decubitus position, the viscera drop into the right side of the abdomen. Exposure can be maintained with a retractor introduced trough the sub-xyphoid port. Dissection of the infrarenal aorta is then conducted through dense and scar tissues, and extended caudally to the prosthesis. After achieving the dissection, the operating table is rotated to the left, which enables a conventional approach to the femoral arteries. The operating table is then returned to the maximum right rotation. The vascular prosthesis is introduced in the abdomen through 1 of the trocars.

The proximal clamp (Storz-France) is introduced through the sub-xyphoid trocar, and stabilizes the viscera in position. A distal celioscopic clamp stabilizes the left mesocolon.

Aortoprosthetic anastomoses are performed with 2 polypropylene (Prolene Ethicon; Johnson & Johnson International) hemicircumferential running sutures. The sutures were previously knotted on Teflon pledgets.

CASE REPORTS

Case 1. An 83-year-old man was referred to our department with bilateral critical limb ischemia. He underwent aortobifemoral bypass and bilateral prosthetic femoropopliteal grafts in 1983. Angiograms demonstrated that all bypasses were occluded. Iliac arteries were occluded with repeat opacification of the right profonda femoris artery and left circumflex lateral artery. Because the body of the graft was thrombosed, we preferred to change the prosthesis, which was implanted 20 years earlier, rather than perform a unilateral embolectomy with a crossover bypass. The patient was scheduled to undergo total laparoscopic repeat aortic surgery, for which he gave informed consent. After dealing with intraperitoneal adhesions, exposure of the infrarenal aorta was obtained through a transperitoneal left retrocolic approach. Scar tissues were dissected, and the infrarenal aorta was exposed to the common iliac arteries. We performed a laparoscopic aortic bypass, distally sutured on a crossover graft implanted between the right profonda femoralis and the left circumflex lateral artery. A left femoropopliteal bypass with homolateral saphenous vein ended the procedure. Patient data are summarized in the Table. The

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Competition of interest: none.

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postoperative course was uneventful, with complete recovery. Total length of stay was 18 days, with return to general diet on day 2 and ambulation on day 5. All bypasses remained patent at 14-month follow-up on computed tomography (CT) scans and duplex ultrasound scans.

Case 2. A 67-year-old man was hospitalized for surgical treatment of an enlarging aortic pseudoaneurysm. Past vascular history included an aortobifemoral bypass to treat AIOD in 1990, femorofemoral bypass to treat left limb occlusion in 1992, and multiple left infrainguinal arterial reconstructions since 1992. Abdominal CT scans and aortograms demonstrated an aortic pseudoaneurysm 3.5 cm in diameter, 2 femoral pseudoaneurysms, and a left limb occlusion. The patient was scheduled to undergo total laparoscopic repeat aortobifemoral bypass, for which he gave informed consent. After dealing with intraperitoneal adhesions, the infrarenal aorta was approached through a transperitoneal left retrocolic approach. Patient data are summarized in the Table. The postoperative course was uneventful. Total length of stay was 11 days, with return to general diet on day 2 and ambulation on day 4. Life-long full anticoagulant therapy was started. At 17-month follow-up the patient had recovered completely. No hemodynamic or morphologic anomalies were observed on CT scans.

Case 3. A 49-year-old man was admitted to our department for treatment of left limb acute ischemia. Past vascular history included aortobifemoral bypass to treat AIOD with laparotomy in 1997. Aortograms showed a left limb occlusion and a right limb proximal stenosis. Because the patient was young, we preferred to change the aortic prosthesis rather than perform only endovascular techniques. The patient was scheduled to undergo total laparoscopic repeat aortic surgery, for which he gave informed consent. After dealing with intraperitoneal adhesions, infrarenal aortic exposure was obtained through a transperitoneal left retrocolic approach. We performed an aortic bypass, implanted distally on the left femoral artery and the right prosthetic limb. Patient data are summarized in the Table. On postoperative day 1 left limb thrombosis required thrombectomy. Total length of stay was 7 days, with return to general diet on day 2 and ambulation on day 3. One month later, left leg acute ischemia developed. Aortograms showed a left limb occlusion and thrombus in the right limb. A right limb thrombectomy was performed, with a combined femorofemoral bypass. Life-long full anticoagulant therapy was started. At 20-month follow-up the patient had recovered completely. Bypasses remained patent on CT scans and duplex ultrasound scans.

Case 4. A 61-year-old woman was referred to our department because of right limb ischemic rest pain. She underwent an aortobiiliac bypass graft to treat AIOD in 1978. Angiograms and CT scans showed a patent left prosthetic limb with a 4-cm infrarenal para-anastomotic aortic pseudoaneurysm (Fig 1). The right prosthetic limb was occluded. The patient was scheduled to undergo total laparoscopic repeat aortobifemoral bypass, for which she gave informed consent. The patient was very thin, and we preferred to use a transperitoneal left retrorenal approach to the infrarenal aorta. The infrarenal aorta was exposed to the common iliac arteries. Despite the location and size of the pseudoaneurysm, infrarenal aortic cross-clamping was possible. Patient data are summarized in the Table. The postoperative course was uneventful. Total length of stay was 6 days, with return to general diet and ambulation on day 3. At 12-month bypass the bypass remained patent on CT scans and duplex ultrasound scans (Fig 2).

Fig 1. Case 4. Abdominal aortogram shows a 4-cm infrarenal para-anastomotic aortic pseudoaneurysm.

DISCUSSION

Repeat aortic procedures are among the most challenging aortic reconstructions. After dealing with intraperitoneal adhesions the surgeon is usually confronted with dense scar tissue enveloping the aorta and previous anastomoses. The most frequent indications for repeat procedures are graft occlusions and para-anastomotic pseudoaneurysms.[5-7] For years the surgical approach to repeat aortic reconstructions has been the transperitoneal route through a laparotomy or the left retroperitoneal route through a lombotomy. Postoperative morbidity of repeat aortic surgery is substantial, and relates to the large abdominal incisions, retroperitoneal dissection through the scar tissues, and blood loss.[5,6] The concept of laparoscopy in aortic surgery is to supplement the excellent long-term results of open surgery with the advantages of minimally invasive surgery, especially, reduction of surgical trauma. Moreover, unlike open techniques, laparoscopy enables reduction in risk for late abdominal wall hernia. Dion et al[8,9] were pioneers in total laparoscopic aortic surgery. Since November 2000 we have performed total laparoscopic procedures for AIOD, and since February 2002 it

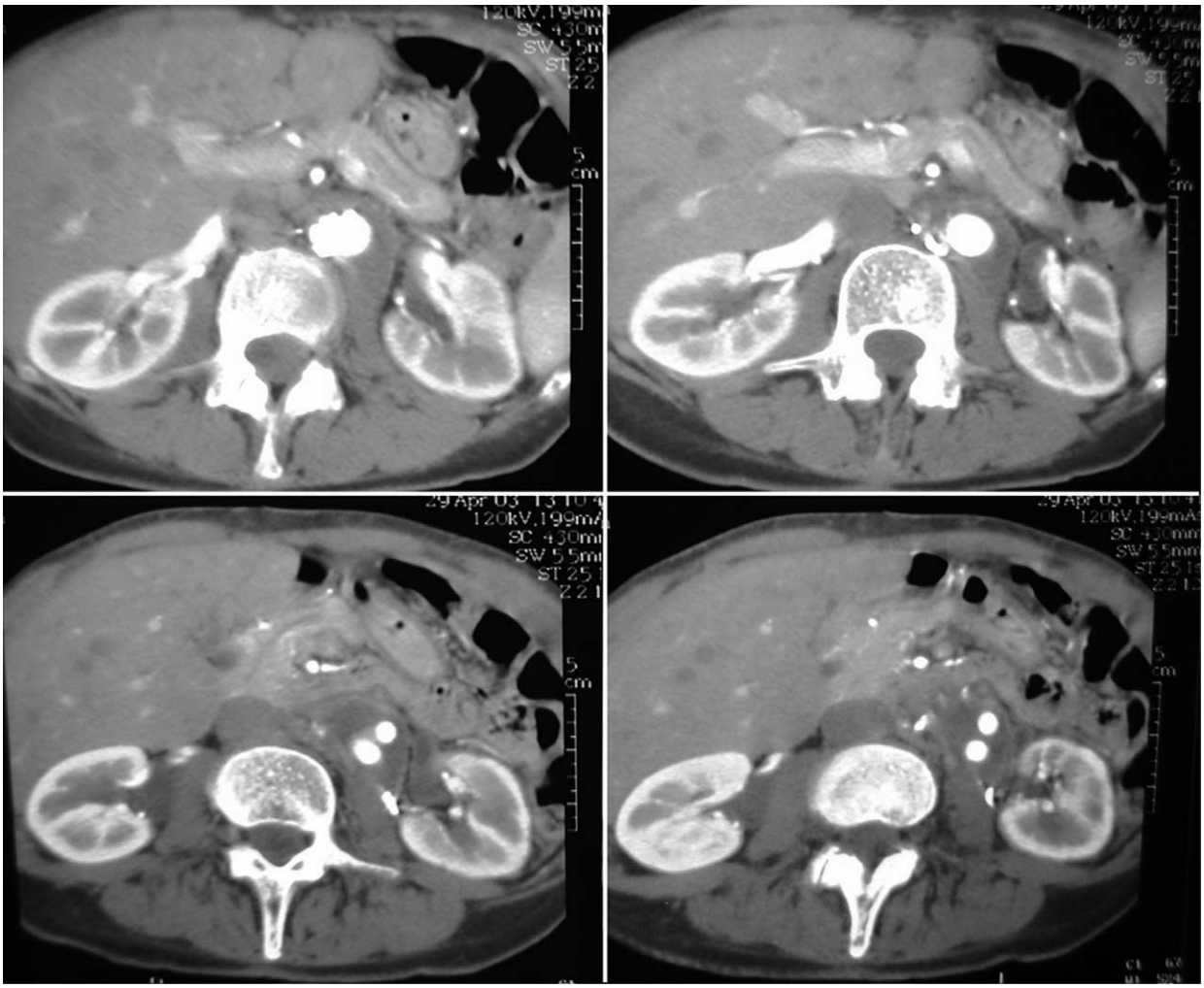

Fig 2. Case 4. Postoperative contrast agent–enhanced abdominal computed tomography scan shows a patent laparoscopic aortobifemoral bypass.

Patient operative data

	Patient 1	Patient 2	Patient 3	Patient 4
Body mass index	27	25	24	16
ASA	3	2	3	3
Operating time (min)	360	480	380	290
Clamp time* (min)	60	50	105	70
Blood loss (mL)	1400	998	1200	1500
Aortic clamp level	Infrarenal	Infrarenal	Infrarenal	Infrarenal
Aortic proximal anastomosis	End-to-side	End-to-end	End-to-side	End-to-end
Body temperature (°C)	35.9	37.8	37.5	34.8
Blood transfusion (red blood cells)	3	1	0	4

ASA, American Society of Anesthesiology.
*Time elapsed between proximal aortic clamping and unclamping of first prosthetic limb.

has become the technique of choice for infrarenal abdominal aortic aneurysm repair. With growing experience, complex laparoscopic procedures are possible,[10] and we decided to perform total laparoscopic procedures in nonselected cases of repeat aortic surgery. Our transperitoneal left retrocolic or left retrorenal approach of the infrarenal aorta enables a stable aortic exposure.[4] Dissection can be extended up to the celiac aorta by means of medial

visceral dissection. Thus the need for suprarenal aortic clamping is not a contraindication for laparoscopy. We did not encounter particular difficulties during laparoscopic repeat aortic procedures except for nonspecific difficult dissection through scar tissue, but we think our previous experience in total laparoscopic aortic surgery is beneficial. If needed, intraoperative decisions can be made to perform a short laparotomy, because of technical difficulties such as venous bleeding, very dense scar tissue, or need for complex revascularization. A videoscopic left retroperitoneal approach could also be used, to avert intraperitoneal adhesions, but we have not used this yet in repeat aortic procedures. With this approach, working space is reduced.[2] Moreover, difficult dissection with bleeding could require vigorous suction, with collapse of the retroperitoneal cavity and immediate loss of visualization. Our results show that postoperative outcomes of total laparoscopic repeat aortic surgery could be comparable to those of open surgery. Operative and aortic clamping times are acceptable, despite the lack of specific laparoscopic instruments needed for repeat aortic surgery. Operative time remains longer than usually observed in conventional surgery. However, it depends also on the time required for complex infrainguinal vascular reconstructions. We found thrombotic complications in case 3, which required repeat intervention but were not related to the laparoscopic technique. The main advantage of total laparoscopic repeat aortic surgery is the reduction of surgical trauma and minimal pain. Since the gold standard aortic reconstruction was performed, we can expect long-term results of open surgery.

CONCLUSION

Preliminary results show that total laparoscopic repeat aortic surgery is feasible, with acceptable short-term outcomes. However, further experience and rigorous comparisons with open or endovascular repeat aortic repair will be needed to ensure the real benefits of this technique. We need also to underline the importance of previous experience in standard laparoscopic aortic surgery before performing repeat laparoscopic procedures.

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